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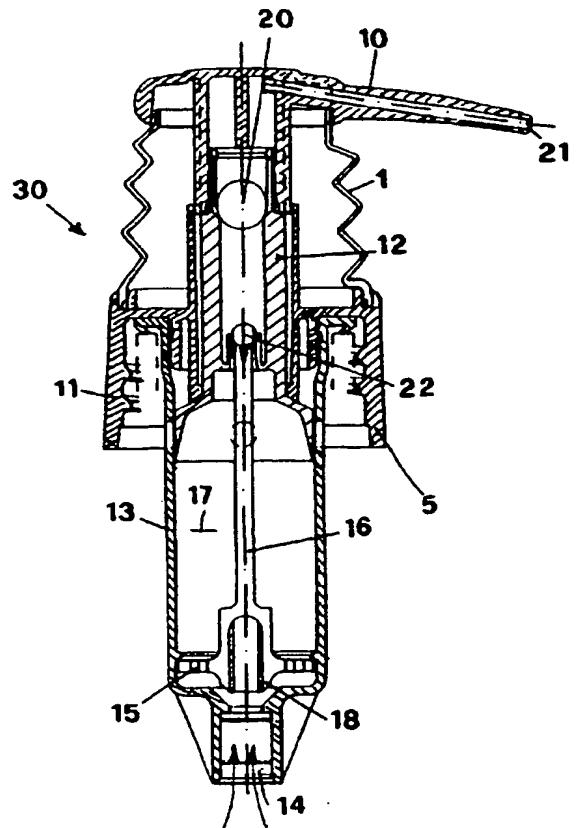
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(54) Title: PLASTIC DOSING PUMP FOR DISPENSING LIQUIDS FROM CONTAINERS

(57) Abstract

Dosing pump for liquids to be connected to a container, comprising: a cylindrical chamber (13; 130) receiving the liquid to be dispensed, a first piston (12; 120) sliding inside said cylindrical chamber, a second piston (16; 160), also placed inside said cylindrical chamber, coaxial with respect to the first piston and acting as a valve element, check valves (20, 18, 22, 220, 180), at least an elastic element (1, 6; 600) that makes the piston go back to its rest position after the dispensing, characterized in that said elastic means (1, 6; 600) is a bellows made of plastic, carried out by injection molding and having a spiral-shaped side surface.



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1 PLASTIC DOSING PUMP FOR DISPENSING LIQUIDS FROM CONTAINERS

2 The invention is a plastic dosing pump for dispensing  
3 liquids from containers, generally made of plastic, too.  
4 As everybody knows, pumps for dispensing liquids from  
5 containers are widespread. They are mainly used, for exam-  
6 ple, to dispense liquid soaps, creams and other types of  
7 detergents or cosmetics.

8 The pumps used at the moment in most dispensers have parts  
9 made of plastic material and others made of steel, such as  
10 the return springs.

11 The presence of two different materials involves problems  
12 in recycling the material.

13 As a matter of fact, if the pump were completely made of  
14 plastic material, the plastic would be salvaged to be  
15 ground without any difficulties, while on the contrary the  
16 presence of ferrous material makes grinding impossible,  
17 since in this case it is first necessary to sort out plas-  
18 tic from iron in order to subsequently grind plastic.

19 Because of these difficulties, the pumps for dispensing  
20 liquids described above do not undergo the recycling of the  
21 material and consequently involve problems as to the dispo-  
22 sal of wastes.

23 A known kind of pumps, even if without metallic parts, is  
24 composed of parts made of plastic materials which are not,  
25 however, compatible with one another, so that the material  
26 obtained after grinding can be recycled, but it cannot be  
27 used again since it is made of incompatible plastic mater-  
28 ials.

29 Some pumps are also known that, instead of a spring, use a  
30 plastic bellows as elastic element, which is obtained by  
31 means of blow molding.

32 Said bellows consists of several elements which are sub-  
33 stantially toroidal and placed one on the other, so that,  
34 as the cross-section shows, the bellows profile has a  
35 sequence of expansions and constrictions on horizontal

- 2 -

1 planes.

2 With this type of profile it is necessary to carry out the  
3 molding by means of the blow molding process because it is  
4 obviously difficult to make an injection mold, since it  
5 would require a tap which actually could not be taken out.

6 The aim of the invention is to get over the difficulties  
7 explained above.

8 One of the goals of the invention is to carry out a pump  
9 for dispensing liquids made of one or more plastic mater-  
10 ials compatible with one another that can be recycled and  
11 used again.

12 Another aim is to get a pump substantially cheaper than  
13 that already known as far as both the materials and the  
14 assembly cycle are concerned.

15 All the above mentioned goals and others that will be  
16 better highlighted below have been achieved by a dosing  
17 pump for liquids to be connected to a container, compris-  
18 ing:

19 - a cylindrical chamber receiving the liquid to be dis-  
20 pensed;

21 - a first, partly hollow piston working inside said cylin-  
22 drical chamber;

23 - a second piston also placed inside said cylindrical  
24 chamber, coaxial with respect to said first piston and  
25 acting as a valve element;

26 - check valves;

27 - at least an elastic element that makes the piston go back  
28 to its rest position after sending out the liquid,  
29 characterized in that said elastic element is a bellows  
30 made of plastic, carried out by injection molding and  
31 having a spiral-shaped side surface.

32 To advantage, according to the invention, the spiral shape  
33 of the outer surface of said bellows makes it possible to  
34 carry out the bellows by the injection molding of thermo-  
35 plastic material, making use of a tap that can be fastened

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1 on or unfastened from the die respectively by screwing or  
2 unscrewing it.

3 The possibility of using the injection molding process,  
4 instead of the blow molding process, allows one to econo-  
5 mize on molding time and as a consequence, in conclusion,  
6 to achieve a cheaper bellows compared to the different-  
7 shaped bellows obtained with the blow molding process.

8 The saving which can be achieved on the cost of the dosing  
9 pump, even if it only concerns the bellows of said pump, is  
10 in any case convincing, if we consider the quantity of  
11 pieces that are produced and demanded by the market.

12 Furthermore, the possibility of making such pumps compat-  
13 ible with the needs connected with the recycling of the  
14 material solves one of the most important problems we have  
15 to face nowadays.

16 Besides, to advantage, the materials making up the pump are  
17 all plastic materials, which, even if different, belong to  
18 the same family of organic plastic materials and can conse-  
19 quently be used again.

20 Other advantages and distinctive features of the invention  
21 in question will be better highlighted in the description  
22 of two applications, chosen among many, of the invention  
23 illustrated in the attached tables:

24 - figure 1 shows the pump object of the present invention  
25 in perspective;

26 - figure 2 shows a cross section of the pump object of the  
27 present invention;

28 - figure 3 shows a cross section of a bellows with a conic-  
29 shaped spiral;

30 - figure 4 shows a side view of the bellows of figure 3;

31 - figure 5 shows an executive variant of the bellows of the  
32 invention here carried out according to the profile of a  
33 cylindrical spiral;

34 - figure 6 shows a side view of the bellows of figure 5;

35 - figure 7 shows an executive variant of the pump object of

- 4 -

1 the present invention represented in its rest position.;

2 - figure 8 shows the executive variant of the pump repre-

3 sented in figure 7 while dispensing the product.

4 With reference to the above mentioned figures it can be

5 noticed in figure 4 that the bellows, referred to as a

6 whole by 1, shows a truncated-cone-shaped surface 2 and

7 this is also evident in the cross section of figure 3.

8 Such a special shape allows the mold tap to respectively

9 screw on and unscrew off the die during the injection

10 molding and consequently makes it possible to take out both

11 the tap and the manufactured product.

12 Figure 3 also shows that, in the receding parts of the

13 cross section, the profile is thicker, as it is shown in 3,

14 obviously to strengthen the bellows on the bending points

15 which are subject to greater stress, without stiffening

16 said bellows.

17 Bellows 1 is open on the upper rim 4 and on the lower rim

18 5; more precisely rim 4 is placed on the lower part of the

19 dispenser element 10 of figure 2, while the lower part 5

20 fits on the cylindrical element 11 that screws on the

21 container, which is not shown in figure 2.

22 Figures 5 and 6 show a variant of the bellows referred to

23 as a whole by 6; the difference lies in the fact that the

24 side surface of said bellows is cylindrical-spiral-shaped

25 instead of conic-spiral-shaped.

26 Obviously, the possibility of molding thermoplastic mater-

27 ial by injection has been left unchanged, since the tap

28 can get into the inside of the die by screwing and then

29 move by unscrewing after the cast and this is due to the

30 fact that the outer and inner surface of the bellows is

31 spiral-shaped.

32 Also in the case of the variant of figures 5 and 6 the

33 thickening of the material 7 is envisaged in the receding

34 parts of the bellows, so that said bellows is strengthened

35 on the weakest parts which are subject to greater stress

- 5 -

1 during the compression.

2 Figure 2 shows that the bellows of the invention, the same  
3 that can be seen in figures 3 and 4, has been set up on a  
4 pump that works in a known way. Actually the dispenser  
5 element 10 is connected to a first piston 12 sliding inside  
6 a cylindrical chamber 13; the liquid to be dispensed flows  
7 inside said chamber first through hole 14 and then through  
8 the distribution holes 15, which are at the bottom 18 of  
9 the second piston 16; said piston is inside the cylindrical  
10 chamber 13 and works as a valve element along with the  
11 upper ball 22.

12 The following outlines basically describe the operation of  
13 the dosing pump object of the invention, which is however  
14 well known.

15 In such a pump, referred to as a whole by 30, when the  
16 dispenser element 10 is pushed down, it pulls also the  
17 first piston 12 which reaches the end of stroke and makes  
18 the second piston 16 position itself so that the opening  
19 14 is closed by its bottom 18.

20 When the dispenser element is loosened, because of the  
21 spring back of bellows 1 also the first piston 12 moves  
22 back upwards. This way it causes also a depression inside  
23 the container of the liquid and consequently the liquid is  
24 drained out of the container and fills the interior 17 of  
25 the cylindrical chamber 13. The liquid flows through hole  
26 14 and through the other holes 15.

27 Pushing down the dispenser element 10 again, both the first  
28 12 and the second piston 16 lower, so that hole 14 is  
29 closed from the bottom 18 of said second piston 16. This  
30 way, since the pressure of piston 12 goes on inside the  
31 chamber 13, the liquid contained in it flows through the  
32 space created by the backlash existing between the inner  
33 diameter of the first piston 12 concerning the rod of the  
34 second piston 16 and the outer diameter of the rod of said  
35 second piston 16. The liquid, lifting the ball 20, reaches

1 the opening 21.

2 When the pressure on the dispenser element 10 stops, the  
3 reversal of the first piston 12 causes the reversal upwards  
4 of the second piston 16 and its consequent disjunction from  
5 the bottom, while the ball 20 gets to the closing position,  
6 so that another quantity of liquid reaches the inner space  
7 17 of the chamber 13 through hole 14 and holes 15, so the  
8 chamber is full of liquid ready to be dispensed again.

9 Figures 7 and 8 show an executive variant of the pump of  
10 the invention, where it can be seen that in such a pump  
11 too, referred to as a whole by 300, the dispenser element  
12 100, when it is pushed down, pulls also a first piston 120  
13 connected to it and provided with an inner hollow 221.

14 The latter, in turn, pulls downwards also the second piston  
15 160 by means of the projections 121; said second piston  
16 160, as it can be observed, is placed on the outside of the  
17 first piston 120 and in the inside of the cylindrical  
18 chamber 130, so as to cause the closing of the passage 140  
19 by means of the valve element consisting of the ball 180.

20 When the dispenser element is loosened, because of the  
21 spring back of bellows 600 the first piston 120 and the  
22 second piston 160 move back upwards, so that the inner  
23 volume 170 of the cylindrical chamber 130 is filled by the  
24 liquid coming from the underlying container and flowing  
25 through the passage 140 left free by the valve element 180  
26 which is raised.

27 Pushing down the dispenser 100 again, the liquid contained  
28 in the volume 170 of the chamber 130 goes into the first  
29 piston 120 by direction 131 and flows outwards through the  
30 dispenser element 100, after going through hole 122 made at  
31 the end 220 of the first piston, where said end acts as a  
32 valve element.

33 The above description of the invention has consequently  
34 highlighted that all the aims of the invention have been  
35 achieved, since they lie in the fact that it is possible to

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1 carry out a pump for dispensing liquids made of plastic  
2 material only.

3 The elements composing the pump object of the invention are  
4 preferably made of polypropylene and polythene, which can  
5 be both recycled and used again after being ground because  
6 they are perfectly compatible, since they belong to the  
7 polyolefin family.

8 Moreover, the bellows, which acts as an elastic element of  
9 the pump, has been carried out by injection molding.

10 Any executive variant is to be considered as completely  
11 protected by the invention in question.

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## 1 CLAIMS

2 1) Dosing pump for liquids to be connected to a contain-  
3 ner, comprising:

4 - a cylindrical chamber (13; 130) receiving the liquid to  
5 be dispensed;

6 - a first piston (12; 120) sliding inside said cylindrical  
7 chamber;

8 - a second piston (16; 160), also placed inside said cylind-  
9 drical chamber, coaxial with respect to the first piston  
10 and acting as a valve element;

11 - check valves (20, 18, 22, 220, 180);

12 - at least an elastic element (1, 6; 600) that makes the  
13 piston go back to its rest position after the dispensing,  
14 characterized in that said elastic means (1, 6; 600) is a  
15 bellows made of plastic, carried out by injection molding  
16 and having a spiral-shaped side surface.

17 2) Dosing pump according to claim 1), characterized in  
18 that said check valves consist of an upper ball (22) and a  
19 bottom (18), each being placed at one end of said second  
20 piston (16) sliding inside said cylindrical chamber (13),  
21 and a ball (20) operating with said first piston.

22 3) Dosing pump according to claim 1), characterized in  
23 that said check valves include the end (220) of said first  
24 piston (120), provided with a hole (122) to connect the  
25 hollow (221) of said first piston (120) to the inner volume  
26 (170) of said cylindrical chamber (130) and with a ball  
27 (180) placed at the bottom of said cylindrical chamber  
28 (130) to intercept the communicating passage (140) of said  
29 pump with the underlying container.

30 4) Dosing pump according to claim 1), characterized in  
31 that said second piston (16) is placed inside said cylind-  
32 drical chamber (13) and is internally coaxial with said  
33 first piston (12).

34 5) Dosing pump according to claim 1), characterized in  
35 that said second piston (160) is placed inside said cylin-

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1  drical chamber (130) coaxial on the outside with said first  
2  piston (120) and is between the outer surface of said first  
3  piston (120) and the inner surface of said cylindrical  
4  chamber (130).

5   6) Dosing pump according to claim 1), characterized in  
6  that said bottom (18) of said second piston (16) works for  
7  the sealing with at least one hole (14) made at the bottom  
8  of said cylindrical chamber (13) and it is provided with  
9  through holes (15) to connect said cylindrical chamber (13)  
10 to said at least one hole (14) made on its bottom.

11   7) Dosing pump according to claim 1), characterized in  
12  that the side surfaces of the bellows are cylindrical-  
13  spiral-shaped.

14   8) Dosing pump according to claim 1), characterized in  
15  that the side surface of the bellows is conic-spiral-sha-  
16  ped.

17   9) Dosing pump according to claims 1), characterized in  
18  that the bellows shows a profile (3, 7) in its receding  
19  parts thicker than the average thickness of said bellows.

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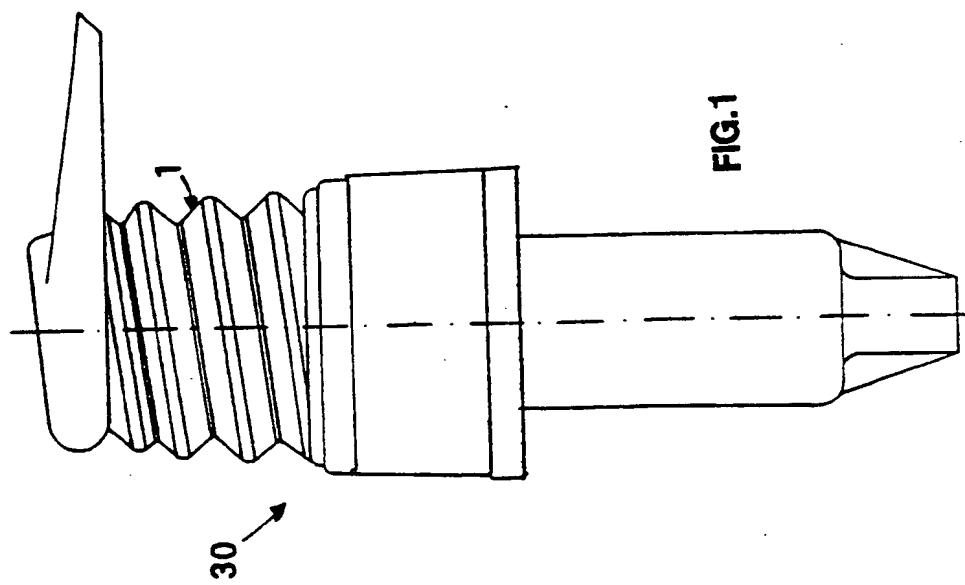
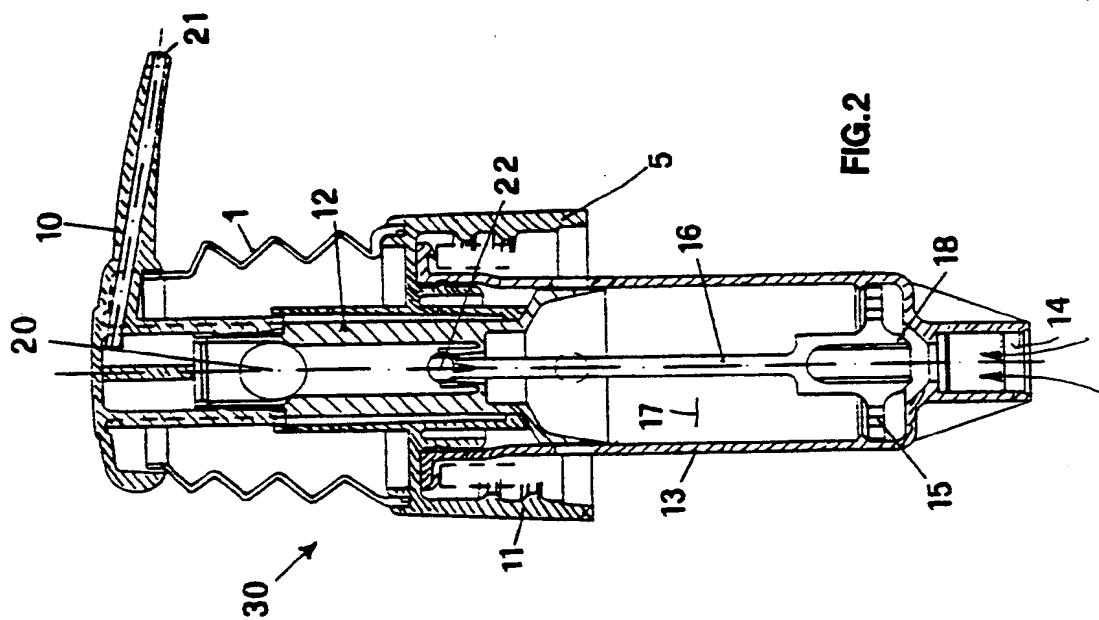
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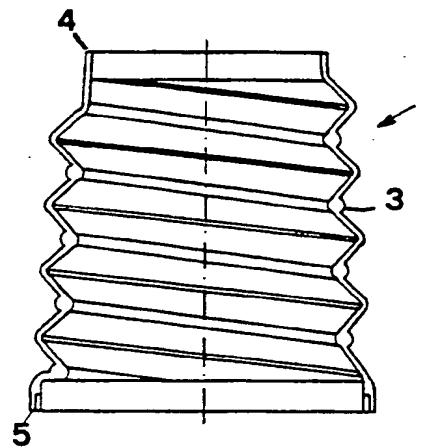


FIG.3

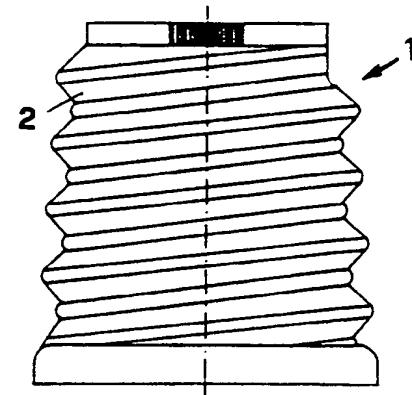


FIG.4

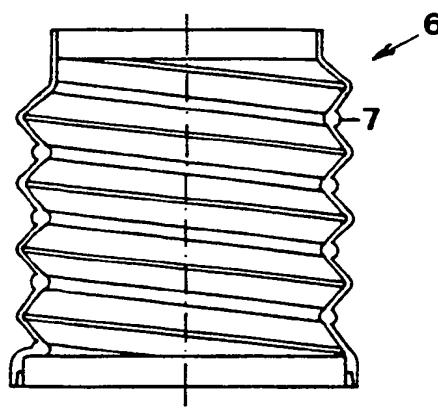


FIG.5

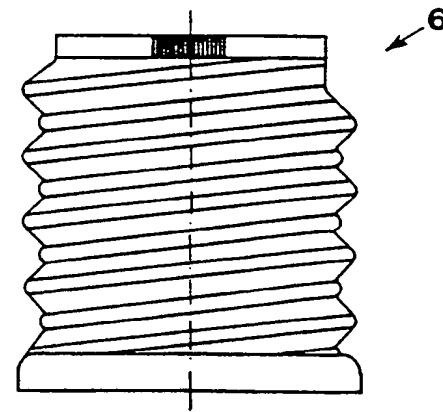
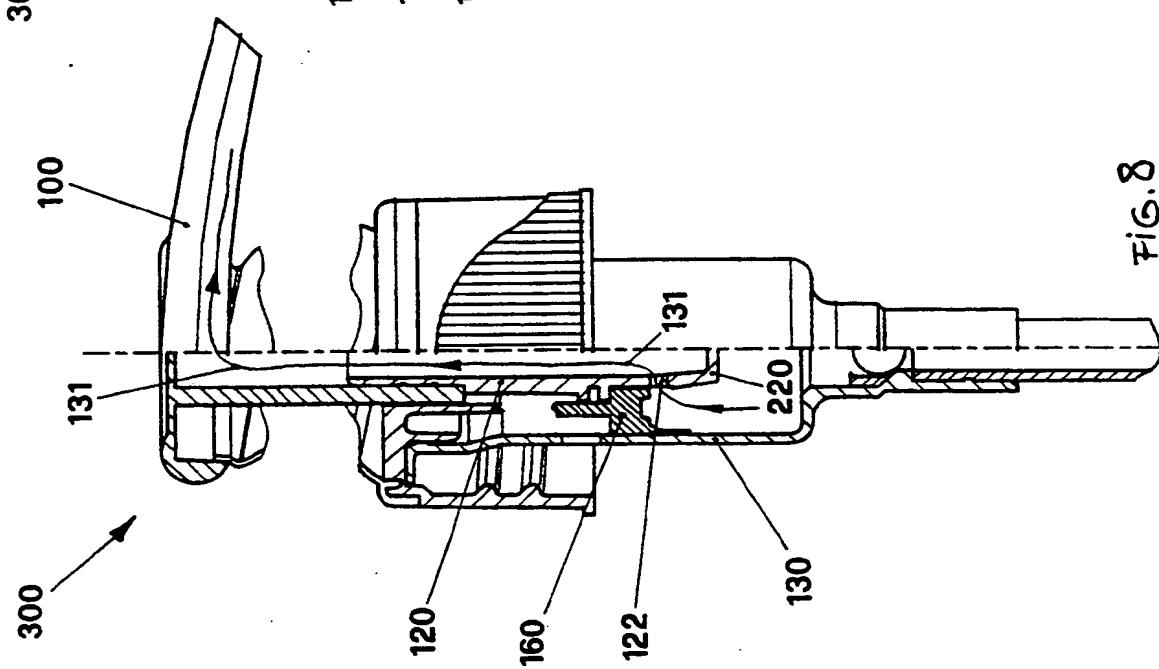
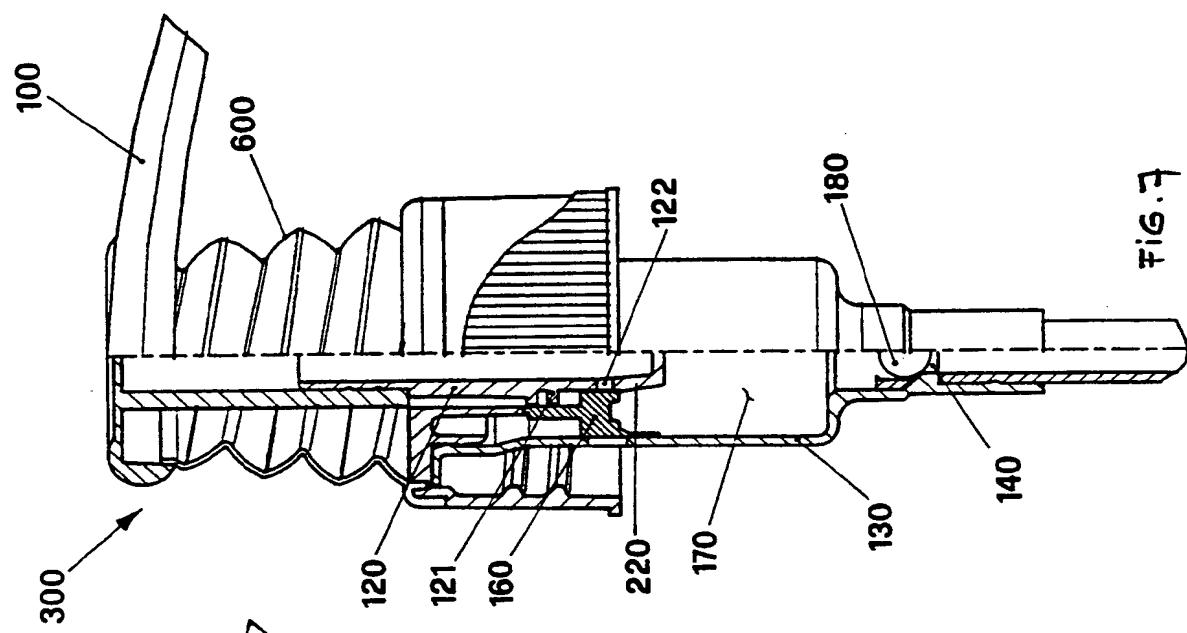


FIG.6

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## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 94/00674A. CLASSIFICATION OF SUBJECT MATTER  
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## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 5 B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,39 28 524 (MEGAPLAST) 14 March 1991 see the whole document ---	1
Y	WO,A,91 03321 (MEGAPLAST DOSIERSYSTEM) 21 March 1991 see page 12, line 13 - line 21; figures 1,14 ---	1,4,7,9
Y	EP,A,0 340 724 (TUBEX VERTRIEB) 8 November 1989 see abstract; figure 7 ---	1,4,7,9
A	FR,A,1 236 720 (THE DRACKETT COMPANY) 13 June 1960 see the whole document ---	2,3
A	DE,A,39 09 633 (MEGAPLAST) 11 October 1990 see column 3, line 2 - line 7; figure 2 ---	1,8
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CH,A,415 486 (LANVIN) 13 January 1967 see the whole document ---	2
A	EP,A,0 469 368 (MAS S.P.A.) 5 February 1992 see abstract; figure 1 ---	5,6
A	EP,A,0 505 974 (PFEIFFER) 30 September 1992 see abstract; figure 1 see column 3, line 34 - line 42 ---	1
A	BE,A,718 118 (RALET) 31 December 1968 see the whole document -----	1

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-3928524	14-03-91	US-A-	5152434	06-10-92
WO-A-9103321	21-03-91	DE-A-	3928521	14-03-91
EP-A-0340724	08-11-89	DE-A-	3814738	09-11-89
		DE-A-	3814739	09-11-89
FR-A-1236720		CH-A-	362033	
		DE-B-	1266647	
		GB-A-	906875	
		NL-C-	106608	
		US-A-	2956509	
DE-A-3909633	11-10-90	NONE		
CH-A-415486		NONE		
EP-A-0469368	05-02-92	NONE		
EP-A-0505974	30-09-92	DE-A-	4110303	01-10-92
		US-A-	5316198	31-05-94
BE-A-718118	31-12-68	CH-A-	481328	15-11-69

